

SCENARIO NOTE

Meeting of the Deputy Minister Committee on Inclusiveness and Growth (DMIG)

Date/Time:	Thursday, September 28, 2017, 2:00pm to 4:00pm EST
Location:	16th Floor, 90 Elgin Street, Ottawa, ON
Subject:	External expert presentation on artificial intelligence, a debrief the June 21 meeting of the Coordinating Committee of Deputy Ministers (CCDM), and a discussion of the forward agenda. The agenda is attached in Annex A .
Participants:	Avi Goldfarb, Ellison Professor of Marketing at the Rotman School of Management, University of Toronto. DMIG members, listed in Annex B .

You are attending a meeting of the DMIG on September 28. The first item on the agenda is a one hour presentation and roundtable with Avi Goldfarb on the economics of artificial intelligence, followed by a 20 minute debrief of the CCDM meeting of June 21, and a half-hour discussion of the future of the DMIG.

Departmental Objectives

This is the first meeting of the DMIG which you will attend as the DM of Infrastructure and Communities. Your participation in this committee provides the department with a unique perspective on the contribution that infrastructure investments make towards inclusive growth, and for this meeting in particular, considerations for federal, provincial and private infrastructure investments in the context of rapid technological change.

Background

Infrastructure investments ensure that Canadian cities and communities can attract talent and investment; can compete in the global economy; and, are places people want to live, work, and raise their families. Targeted investment in areas that address core economic issues related to trade, urban congestion, and energy improves competitiveness and economic growth.

Infrastructure investments can also contribute to inclusive growth. For example, the integrated bilateral agreements INFC will sign with provinces and territories seek to improve access to public transit, a key resource for accessing economic opportunities; investments in rural and northern communities will improve food security, reliable road, air and marine infrastructure, broadband connectivity, and efficient and reliable energy, supporting growth in communities facing economic challenges; and investments in cultural, recreational and community infrastructure, specifically Indigenous Peoples, will support more inclusive communities. In addition, for the integrated bilateral agreements, INFC will encourage provinces and territories to use procurement practices that encourage employment opportunities for women, veterans, apprentices, newcomers to Canada, and Indigenous peoples, as well as opportunities for local, small enterprises.

In terms of innovation and new technologies, incorporating technology in infrastructure asset management practices can provide data to improve management of those assets and planning for rehabilitation. In addition, disruptive technologies, including artificial intelligence, that change the way people live and work will have an effect on urban and community planning, and infrastructure required to support economic growth. For example, changes in how people work would change commuting patterns and habits, which in turn affect demand for transit. Research into this topic is part of INFC's medium term planning exercise, for which INFC would connect with other departments on technology megatrends, and demographic needs and trends.

Artificial intelligence

Avi Goldfarb is the Ellison Professor of Marketing at the Rotman School of Management, University of Toronto. His latest publication *What to Expect from Artificial Intelligence*, 2017, describes how advances in artificial intelligence are likely to change the workplace — and the work of managers. The idea behind this premise is that the value of some human skills will rise while others fall. In this situation, managers need to be aware of where AI delivers the most value to help reduce costs.

Goldfarb and his collaborators explore how improvement in AI is linked to advances in prediction. Based on their research, AI can help managers solve problems that were not previously prediction oriented. Their research provide information on how technological change has affected the cost of previous tasks, allowing them to anticipate how AI may affect what workers and managers do.

Biography of Avi Goldfarb and suggested questions for the roundtable is included as **Annex C**.

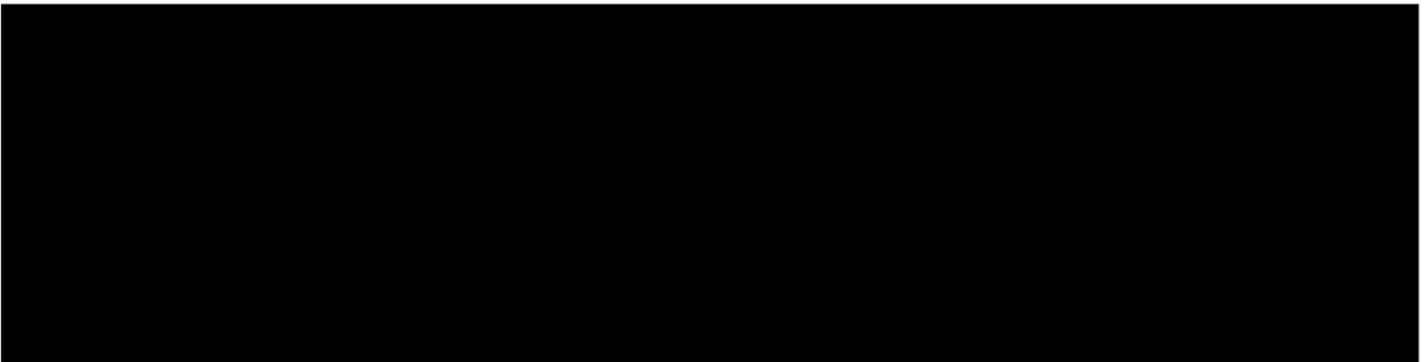
Debrief of the CCDM meeting of June 21

The primary topic at the June 21 meeting was feminist government, and what such an approach would aim to achieve. This could include advancing opportunities for both women and men to be in positions of leadership and contribute to decisions; providing support to women to pursue occupations in fields traditionally dominated by men; providing equitable opportunities to paid work, and a balanced distribution of unpaid work (e.g. child care, care for seniors); and access to physical and psychological security. Examples of International best practices & actions were shared.

Future Direction of the Committee

The DM Committee on Inclusive Growth (DMIG) has been mandated by the Clerk to investigate the impacts of growth, and public policies and programs in support of growth, on the various social and income groups in Canada with a view to inform public policy proposals.

DMIG's work plan was approved at the June CCDM meeting. The committee will spend the remainder of the fiscal year working to improve cross-departmental collaboration, identify and resolve capacity gaps and find pro-growth and pro-inclusiveness policies that could be candidates for government action.



[REDACTED] (INFC's response to the PCO Survey on Departmental MTP Priorities is included in **Annex D**).

[REDACTED]

A PowerPoint presentation on the Future Direction of DMIG is included in **Annex E**.

Speaking Points

AI presentation

Do you know of any examples of cities or others using artificial intelligence to analyse data on trade patterns, traffic patterns, or housing trends, or any other key issues for city life?

Feminist Government

A feminist agenda will need to be supported by strong data and a solid evidence base, to understand for example, how areas like infrastructure affect women and men differently. We have some evidence that women use public transit more than men, for example, but the data set is limited. INFC would be happy to work with Statistics Canada and others to assess these data needs.

DMIG Future Direction

INFC could contribute to the work on regional disparities, or on challenges and opportunities for long term prosperity.

Annexes

Annex A – Agenda for DMIG September 28, 2017

Annex B – DMIG membership

Annex C – Bio of Avi Goldfarb and questions for discussion

Annex D – Survey on Departmental Medium-Term Policy Planning (MTP) Priorities

Annex E – Presentation on the Future Direction of the Committee

DEPUTY MINISTER COMMITTEE ON INCLUSIVE GROWTH (DM-IG)**AGENDA**

**Meeting of September 28, 2017, 2:00pm to 4:00pm EST
16th Floor, 90 Elgin Street, Ottawa, ON**

1. Introduction (5 minutes)

Welcoming remarks by DM-IG Co-Chairs

2. Roundtable with Avi Goldfarb on Artificial Intelligence (60 minutes)

Discuss the economics of artificial intelligence with Avi Goldfarb, the Ellison Professor of Marketing at the Rotman School of Management, University of Toronto

3. Debrief of the June 21 Meeting of the CCDM (20 minutes)

DM-IG Co-chairs will provide a debrief of the June 21 meeting of the Coordinating Committee of Deputy Ministers (CCDM)

4. Discussion on the Future Direction of the DM-IG (30 minutes)

Review and discuss the deck prepared on what the Committee has learned to date and a proposal for the future direction of the Committee

5. Conclusion and Next Steps (5 minutes)

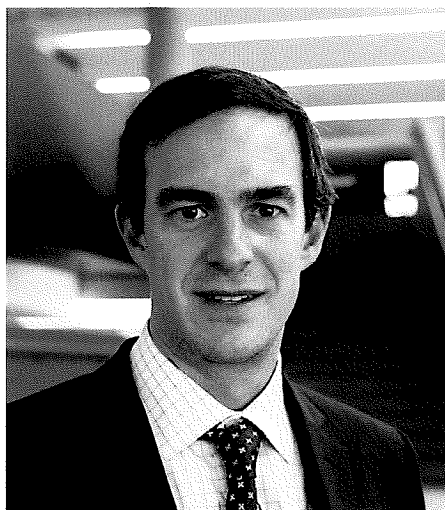
Advance notice: next meeting on October 23 featuring a presentation from [REDACTED]

[REDACTED]

ANNEX B –Membership of the Deputy Ministers' Committee on Inclusive Growth

Co-chairs: Paul Rochon and Louise Levonian

Members: Anil Arora, Manon Brassard, Chris Fox, Jonathan Fried, Kelly Gillis, Bob Hamilton, Dylan Jones, Diane Lafleur, Chantal Maheu, Matthew Mendelsohn, Marta Morgan, Lori Sterling, Christyne Tremblay

Avi Goldfarb

Avi Goldfarb is the Ellison Professor of Marketing at the Rotman School of Management, University of Toronto. He is also a Research Associate at the National Bureau of Economic Research, Chief Data Scientist at the Creative Destruction Lab, and Senior Editor at Marketing Science. Professor Goldfarb's research focuses on understanding the opportunities and challenges of the digital economy and has been funded by Google, Industry Canada, Bell Canada, AIMIA, SSHRC, and others. His research has been published in over 50 articles in a variety of prominent outlets in economics, marketing, statistics, computing, and law.

Recently, Professor Goldfarb finished co-authoring a book entitled "Prediction Machines: The Simple Economics of Artificial Intelligence" with Rotman colleagues Ajay Agrawal and Joshua Gans. This book provides a framework with which to think about how artificial intelligence (AI) will impact the economy. In this framework, data, prediction and judgement combine to determine actions involved in economic activity. The expected impact of AI is then that it will significantly lower the cost of prediction which will in turn: decrease the value of pre-existing prediction methods; increase the use of prediction as it is used more intensively and more broadly in new applications; and complement and raise the value of data and judgement.

Professor Goldfarb received his BA in Economics from Queen's University and his Ph.D. in economics from Northwestern University.

DEPUTY MINISTER COMMITTEE ON INCLUSIVE GROWTH (DM-IG)
September 28th, 2017

Roundtable with Avi Goldfarb
Ellison Professor of Marketing, Rotman School of Management

Suggested Questions for Discussion:

- 1) What is your overall framework for thinking about the economics of AI?
- 2) What were the key takeaways from the Rotman-NBER conference on the Economics of AI? What were the major areas of consensus and disagreement among experts?
- 3) What questions remain largely unanswered with respect to the potential implications of AI?
- 4) How do you expect AI and other disruptive technologies to impact economic growth, the labour market, and inequality? In general, will AI and other disruptive technologies affect the labour-market outcomes of women and men differently?
- 5) What can governments do to both maximize the growth-enhancing potential of AI and other disruptive technologies, and ensure the benefits are broadly shared?
- 6) To what degree should Canada focus on supporting cutting-edge AI research in Canada versus promoting the adoption of AI technologies to enhance economic growth?

Prediction Machines: The Simple Economics of Artificial Intelligence

Ottawa, September 28, 2017

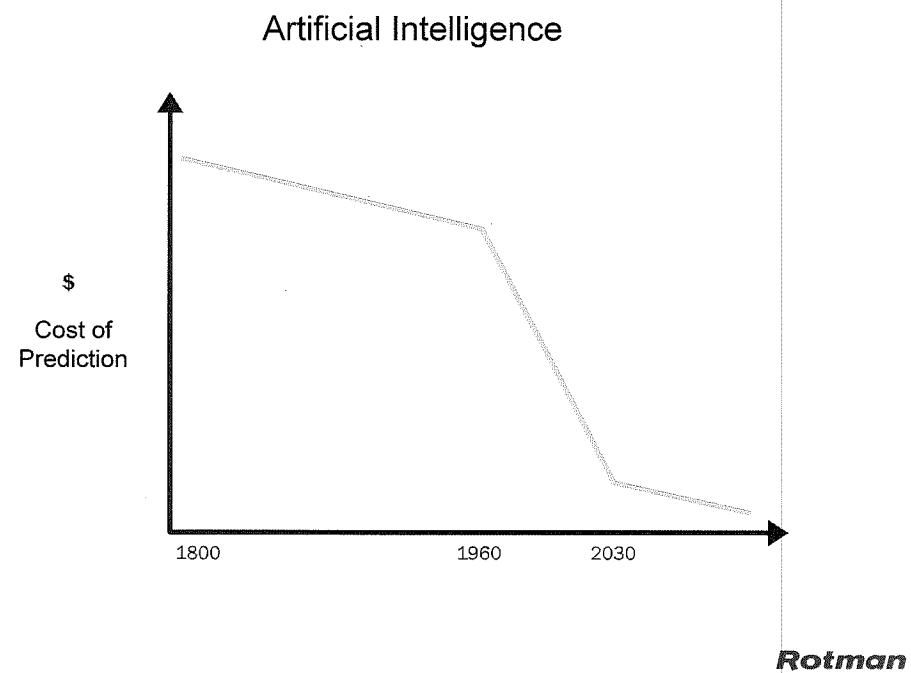
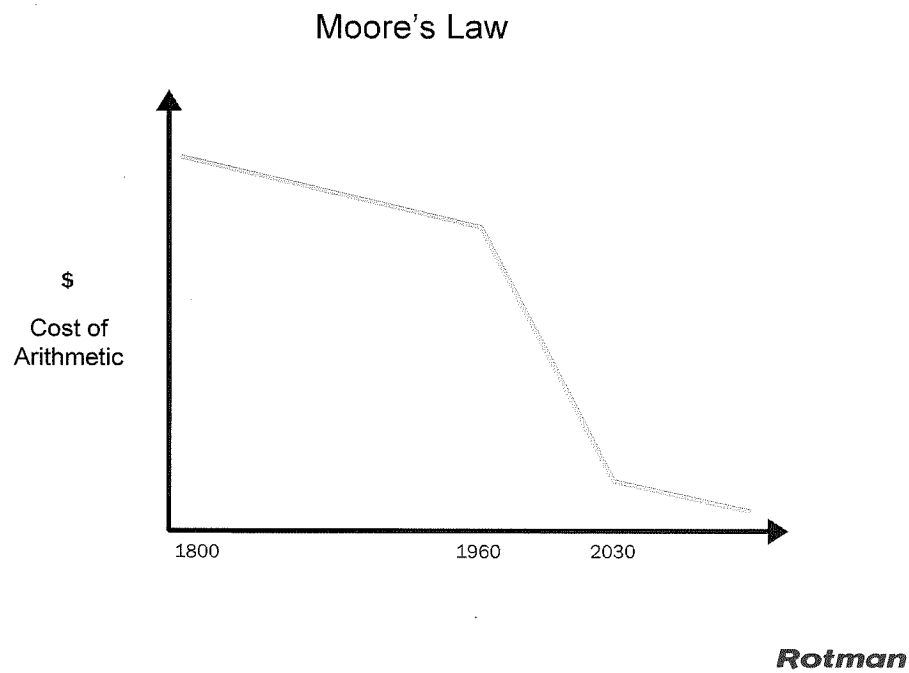
Avi Goldfarb

Rotman School of Management, Creative Destruction Lab, and NBER
(based on research with Ajay Agrawal and Joshua Gans)

Rotman



Rotman



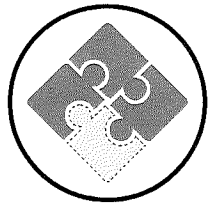
Main Idea

Advance in AI

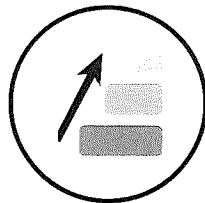


Drop in cost
of prediction

Implications



Expanding role
of prediction as
an input



Changing
value of other
inputs

Rotman

A.I. in Canada

Université
de Montréal



Yoshua Bengio

UNIVERSITY OF
TORONTO



Geoffrey Hinton

UNIVERSITY OF
ALBERTA



Richard Sutton

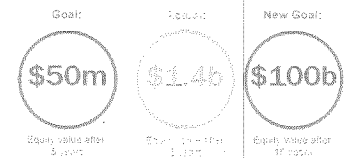
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JACOBS, POUTANEN, ZEMEL, HINTON AND CLARK
Artificial intelligence is the future, and
Canada can seize it

JORDAN JACOBS, TONIE POUTANEN, RICHARD ZEMEL, GEOFFREY HINTON
AND ED CLARK
Opinion to The Globe and Mail
Published Saturday, Jan. 07, 2017 8:00AM EST
Last updated Saturday, Jan. 07, 2017 10:07AM EST

**CREATIVE
DESTRUCTION LAB**



150 A.I. companies this year

THE
GLOBE
AND
MAIL

Creative Destruction Lab expands
startup program nationally



Rotman

On 13-14 September, 2017, we held our inaugural conference in Toronto to set the research agenda on The Economics of AI. The conference was made possible by generous support from the NBER, Creative Destruction Lab and CIFAR. Ajay Agrawal, Joshua Gans and Avi Goldfarb of the University of Toronto organised the conference.

Presentation Videos



Speakers

David Autor, Susan Athey, Erik Brynjolfsson, Colin Camerer, Tyler Cowen, Dave Donaldson, Austan Goolsbee, Rebecca Henderson, Chad Jones, Daniel Kahneman, Joel Mokyr, Jeff Sachs, Carl Shapiro, Scott Stern, Betsey Stevenson, Larry Summers, Chad Syverson, Manuel Trajtenberg, Dan Trefler, Hal Varian, Catherine Tucker, etc.

Machine Learning vs. Artificial General Intelligence Jobs, Income, and Inequality Regulation

Rotman

Survey on Departmental Medium-Term Policy Planning (MTP) Priorities

Department: INFC

Key Contact: Alain Desruisseaux, A/ADM Policy

Please identify 2-6 MTP priorities per department / Deadline: June 30, 2017

MTP Priority 1: Federal role in infrastructure investments by other orders of government

Budgets 2016 and 2017 announced bilateral allocations, national programs and the Canada Infrastructure Bank to deliver funding support for infrastructure investments by other orders of government. These programs will be in addition to continuing programs and funds, for example the Gas Tax Fund and the First Nation Infrastructure Fund.

Does the current mix of approaches to federal support for infrastructure investments by other orders of government achieve federal objectives, given trends in infrastructure delivery, other federal policies and priorities (i.e. inclusive growth, innovation agenda, renewed nation-to-nation relationship with Indigenous peoples, among others) and Canadians' expectations? What are other models of delivering support for infrastructure planning and investment that could be deployed to maximize results? Do programs incent innovation, particularly in sectors known for their conservatism such as construction, and if not, how could they? The focus would be on programs other than those announced in Budgets 2016 and 2017.

Status/Possible timelines

INFC would need to explore current models for delivering support for infrastructure investments in the federal government, as well as practices employed by other national governments.

MTP Priority 2: Urban agenda

The Canadian population is increasingly urbanized, diverse and concentrated in a few urban centers: The top 10 population centres (formerly called urban centres) represents 49% of Canada's population. These centres are engines for economic growth and must remain internationally competitive, attractive as places to invest, live and work. At the same time, infrastructure needs are evolving and are influenced by changes such as the rapid advancements in technology that alter the way Canadians live and work, climate change, and demographic shifts.

What kinds of infrastructure will Canadian urban centers require to meet economic, social and climate challenges? How will urban centers and infrastructure needs change with technological advances? How would or should the relationship between urban centers and other orders of government evolve, for example through partnerships arrangements where local governments play an increasing role on both

domestic and international scenes with limited fiscal devolution?

Status/Possible timelines

INFC could tap into the work that OGDs like NRCan and ISED are doing on technology megatrends and R&D as well as OGDs like ESDC, IRCC and PHAC are doing on demographic and population issues and needs and trends.



Future Direction of the Committee

September 28, 2017

Deputy Ministers' Committee on Inclusive Growth

Canada



The Federal Framework on Inclusive Growth

The DM Committee on Inclusive Growth (DMIG) has been mandated by the Clerk to:

- Deepen our understanding and ability to assess the impacts of growth, and public policies and programs in support of growth, on the various social and income groups in Canada;
- Consider strategic orientations for Government policies that support prosperity for all Canadians and make Canada's redistributive policies more effective and resilient to labour market transformations, including those driven by technological change; and
- Examine and inform major policy proposals from the lens of inclusive growth.

In June, CCDM agreed to the general objectives proposed for DMIG's framework:

- Improve cross-departmental collaboration and develop the capacity to assess inter-relationships between growth and equity objectives;
- Identify policy gaps that could hinder strong and inclusive growth going forward; and
- Identify specific pro-growth and pro-inclusiveness policies that could be candidates for government action.



What we've learned: Key challenges for inclusive growth

Upon consideration of a range of challenges for inclusive growth, DMIG's secretariat has identified two priority areas for further analysis [REDACTED]

1. Persistent barriers and disincentives to the full economic participation of particular demographic groups

- Particular demographic groups (e.g. women, Indigenous peoples, lone-parent families, older Canadians, lower-skilled workers, recent immigrants, Canadians with disabilities) are not able to fully participate in many economic and social opportunities, and often have worse outcomes across a wide array of indicators
- Structural developments, economic and social barriers, and public policies have contributed to regional divides, which may be exacerbated by future disruptions

2. Uncertain future: key challenges and opportunities for long-term prosperity

- Canada faces many headwinds: population aging, slower productivity growth, international competitive pressures, protectionism, and the transition to a low-carbon economy
- While disruptive technologies and automation could contribute to economic growth and support the transition to a low-carbon economy, they will also create winners and losers and potentially raise inequality

**Page(s) 17 to 18
are exempted
pursuant to paragraphs
21(1)(a) and 21(1)(b)
of the *Access to Information Act***

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conformément aux dispositions des
paragraphes
21(1)(a) et 21(1)(b)
de la loi sur l'accès à l'information**



Proposed schedule of meetings

October 23, 2017

- Presentation from [REDACTED]

January [TBD], 2018

- Joint meeting of DMIG and DM Committee on Economic Trends and Policies (DM-ETP) on skills
 - Roundtable with SSHRC on disruptive technologies, the labour market and skills